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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China





DisplayPort VIP Input Board

Evaluation Board User Guide

FPGA-EB-02014-1.0

March 2018

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Acronyms in This Document

A list of acronyms used in this document.

Acronym	Definition
DP	DisplayPort
I ² C	Inter-Integrated Circuit
LDO	Low Dropout
LED	Light-emitting Diode
LVDS	Low-Voltage Differential Signaling
mDP	Mini DisplayPort
SPI	Serial Peripheral Interface
VIP	Video Interface Platform

1. Introduction

This document describes the Lattice Semiconductor DisplayPort® VIP Input Board. This board is designed to work with the Lattice Video Interface Platform (VIP) board interconnect system.

This user guide includes descriptions of board components, schematics, and bill of materials.

Key features of the DisplayPort VIP Input Board include:

- Integrated Texas Instruments SN75DP130 DisplayPort 1:1 Redriver
- Mini DisplayPort (mDP) connector
- Two 60-pin Rugged High-Speed Headers

Figure 1.1 shows the top view of the DisplayPort VIP Input Board and its key components. Figure 1.2 shows the bottom view of the board.

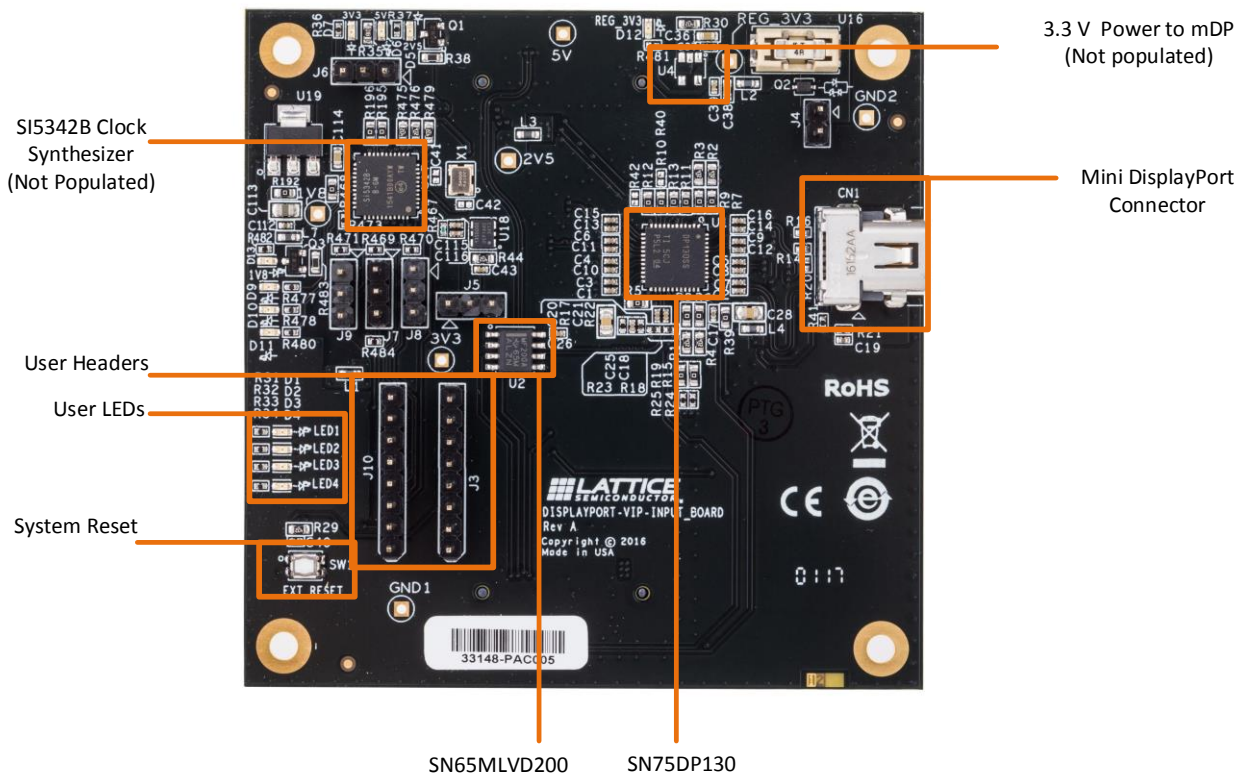


Figure 1.1. Top View of DisplayPort VIP Input Board

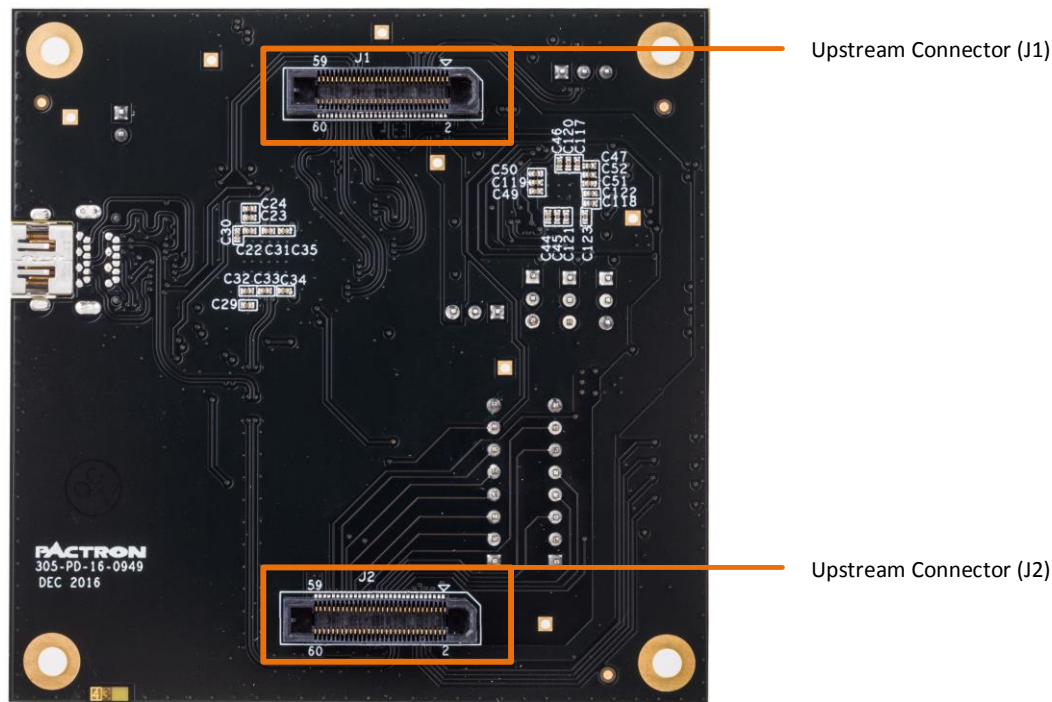


Figure 1.2. Bottom View of DisplayPort VIP Input Board

1.1. Further Information

The following references provide detailed information on the DisplayPort VIP Input Board:

- [Appendix A. DisplayPort VIP Input Board Schematics](#)
- [Appendix B. DisplayPort VIP Input Board Bill of Materials](#)
- For more information on boards and kits available for the VIP (Video Interface Platform) system visit www.latticesemi.com/boards
- For details on the Texas Instruments SN75DP130, visit the Texas Instruments website at www.ti.com

2. Functional Description

The DisplayPort VIP Input Board receives up to 4-lanes of DisplayPort video from the Mini DisplayPort Connector. The DisplayPort Main Link, Control and Aux Channel are sent through the TI DisplayPort redriver, which regenerates the DisplayPort high-speed digital link to connector J1.

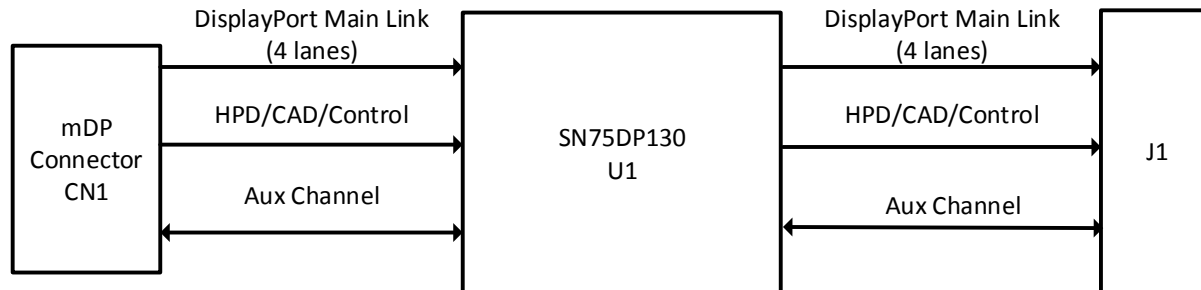


Figure 2.1 Functional Block Diagram

2.1. Switches

The push button switch, SW1, controls the reset signal RESET. Pressing SW1 provides logic 0 to the SN75DP130 RSTN pin. RESET is connected to GSRN on connector J1, allowing SW1 to control the reset signal for other connected boards.

2.2. DisplayPort Interface

The mini DisplayPort connector, CN1, connects the DisplayPort VIP Input Board to a DisplayPort sink. If PWR Out is required on Pin 20, the user must populate the 3.3 V Low Dropout (LDO) regulator, U4, and short jumper J4.

2.3. LVDS Translator

The SN65MLV200 LVDS (Low-Voltage Differential Signaling) Driver/Receiver, U2, can be used to translate the LVDS AUX Channel to single ended I/O. This can be used if the downstream processor board is unable to receive LVDS. The single ended I/O are routed to connector J2.

2.4. Clock Interface

The DisplayPort VIP Input Board provides the ability to add advanced clock circuitry, allowing the user to provide a fine tunable reference clock to the downstream board. This is done by populating U17 with a Silicon Labs Si5342B, High Performance Jitter Attenuator Clock Multiplier. The device can be programmed from the downstream connector using an I²C (Inter Integrated Circuit) or SPI (Serial Peripheral Interface) interface.

3. High-Speed Headers

The two 60-pin high-speed headers, connectors J1 and J2, are used to connect to a downstream host processor board.

Table 3.1. Connector J1

J1 Connector Pin	Signal Name	SN75DP130 pin	Description
1	3.3V	—	—
2	5V	—	—
3	3.3V	—	—
4	5V	—	—
5	GND	—	—
6	5V	—	—
7	LVDS_P	—	LVDS Reference Clock from Si5342
8	GND	—	—
9	LVDS_N	—	LVDS Reference Clock from Si5342
11	GND	—	—
13	AUX_P	AUX_SRCp	DisplayPort Auxiliary Data Channel
14	GND	—	—
15	AUX_N	AUX_SRCn	DisplayPort Auxiliary Data Channel
17	GND	—	—
20	GND	—	—
22	2.5V	—	—
23	GND	—	—
24	2.5V	—	—
25	GND	—	—
26	GND	—	—
28	RESET	RSTN	Global System Reset
30	HPD_SINK	HPD_SINK	Hot Plug Detect
32	CAD_SINK	CAD_SINK	DP Cable Adapter Detect
34	GND	—	—
36	RXP0_D1CH0	OUT2p	DisplayPort Main Link Lane 0
38	RXN0_D1CH0	OUT2n	DisplayPort Main Link Lane 0
40	GND	—	—
41	SCL_CTL	SCL_CTL	I ² C Interface to SN75DP130
42	RXP0_D1CH1	OUT3p	DisplayPort Main Link Lane 1
43	SDA_CTL	SDA_CTL	I ² C Interface to SN75DP130
44	RXN0_D1CH1	OUT3n	DisplayPort Main Link Lane 1
46	GND	—	—
48	RXP0_DOCH0	OUT0p	DisplayPort Main Link Lane 0
50	RXN0_DOCH0	OUT0n	DisplayPort Main Link Lane 0
52	GND	—	—
54	RXP0_DOCH1	OUT1p	DisplayPort Main Link Lane 1
55	GND	—	—
56	RXN0_DOCH1	OUT1n	DisplayPort Main Link Lane 1
57	GND	—	—
58	GND	—	—
59	GND	—	—
10, 12, 60, 16, 18, 19, 21, 27, 29, 31, 33, 35, 37, 39, 45, 47, 49, 51, 53	Not Connected	—	—

Table 3.2. Connector J2

J1 Connector Pin	Signal Name	SN75DP130 pin	Description
1	3.3V	—	—
2	3.3V	—	—
3	3.3V	—	—
4	3.3V	—	—
7	AUX_EN	—	Aux Channel Translator Enable
8	LED1	—	User LED
9	AUX_OUT	—	Aux Channel single ended Out
10	LED2	—	User LED
11	AUX_IN	—	Aux Channel single ended In
12	LED3	—	User LED
13	EN	EN	SN75DP130 Enable
14	LED4	—	User LED
17	GND	—	—
18	GND	—	—
19	GND	—	—
20	GND	—	—
21	SPI_CSN	—	Si5342 I ² C/SPI Interface
22	GND	—	—
23	SPI_CLK	—	Si5342 I ² C/SPI Interface
24	RX_SENSEP	—	—
25	SPI_MOSI	—	Si5342 I ² C/SPI Interface
26	RX_SENSEN	—	—
27	SPI_MISO	—	Si5342 I ² C/SPI Interface
29	INT_N	—	Si5342 Interrupt
30	SDA_DDC	SDA_DDC	I ² C Display Data Channel
31	OE_N	—	Si5342 Output Enable
32	SCL-DDC	SCL_DDC	I ² C Display Data Channel
33	GND	—	—
35	GND	—	—
36	GND	—	—
38	GND	—	—
39	HEADER1	—	User I/O Header J3
40	GND	—	—
41	HEADER2	—	User I/O Header J3
43	HEADER3	—	User I/O Header J3
45	HEADER4	—	User I/O Header J3
47	HEADER5	—	User I/O Header J3
51	CMOS_CLK	—	Reference Clock from Si5342
53	GND	—	—
54	GND	—	—
55	GND	—	—
56	GND	—	—
57	2.5V	—	—
58	2.5V	—	—
59	2.5V	—	—
60	2.5V	—	—
5, 6, 15, 16, 28, 34, 37, 42, 44, 46, 48, 49, 50, 52	Not Connected	—	—

4. Power Supply

Board power is supplied through connectors J1 and J2. [Figure 4.1](#) shows the power distribution scheme. To provide power to the mini DisplayPort connector, install a 5.0 V to 3.3 V LDO at U4 and add shunt to jumper J4.

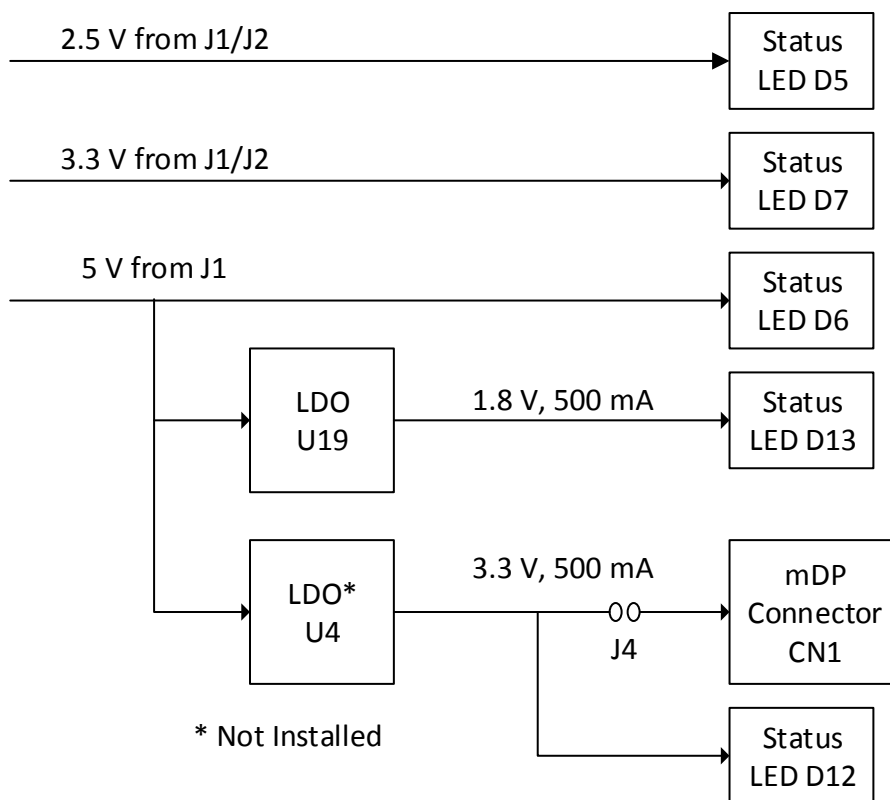


Figure 4.1 Power Supply

5. User LEDs and Headers

Four discrete LEDs (light-emitting diodes) are available to the user. These are driven by the downstream processor board through connector J2.

Table 5.1 User LEDs

Signal	LED #	Connector J2 Pin	Color
LED1	D1	8	Green
LED2	D2	10	Green
LED3	D3	12	Green
LED4	D4	14	Green

Two 8-pin 100-mil headers, J3 and J10, are included on the board. Header J3 provides five user connections which are routed to the downstream connector J2. Header J10 provides an external interface to the Si5342, U17 (not installed), but can also be used to provide user interface to the downstream connector J2.

Table 5.2 Header J3

Signal	Header J3 Pin	Connector J2 Pin
3V3	1	—
HEADER1	2	39
HEADER2	3	41
HEADER3	4	48
HEADER4	5	45
HEADER5	6	47
RESET	7	—
GND	8	—

Table 5.3 Header J10

Signal	Header J10 Pin	Connector J2 Pin
3V3	1	—
SPI_CSN	2	21
SPI_MISO	3	23
SPI_MOSI	4	25
SPI_CLK	5	27
INT_N	6	29
OE_N	7	31
GND	8	—

6. Ordering Information

Please visit www.latticesemi.com/boards for the latest ordering information.

Table 6.1. Reference Part Number

Description	Ordering Part Number
DisplayPort VIP Input Board	DP-VIP-I-EVN

References

For more information, refer to

- [Lattice Embedded Vision Development Kit User Guide \(FPGA-UG-02015\)](#)
- [ECP5 VIP Processing Board \(FPGA-EB-02001\)](#)

Technical Support Assistance

Submit a technical support case through www.latticesemi.com/techsupport.

Appendix A. DisplayPort VIP Input Board Schematics

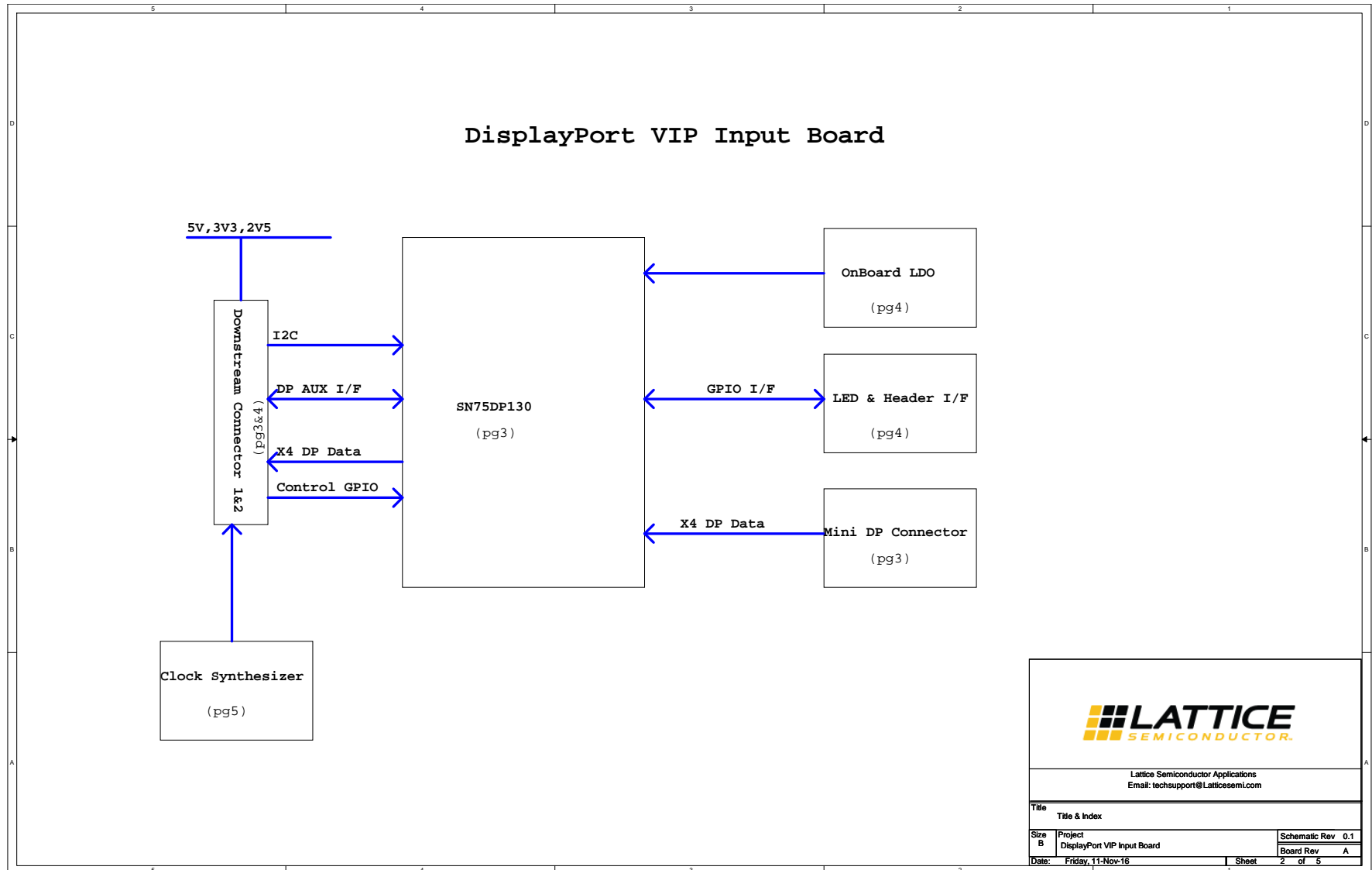


Figure A.1. Block Diagram

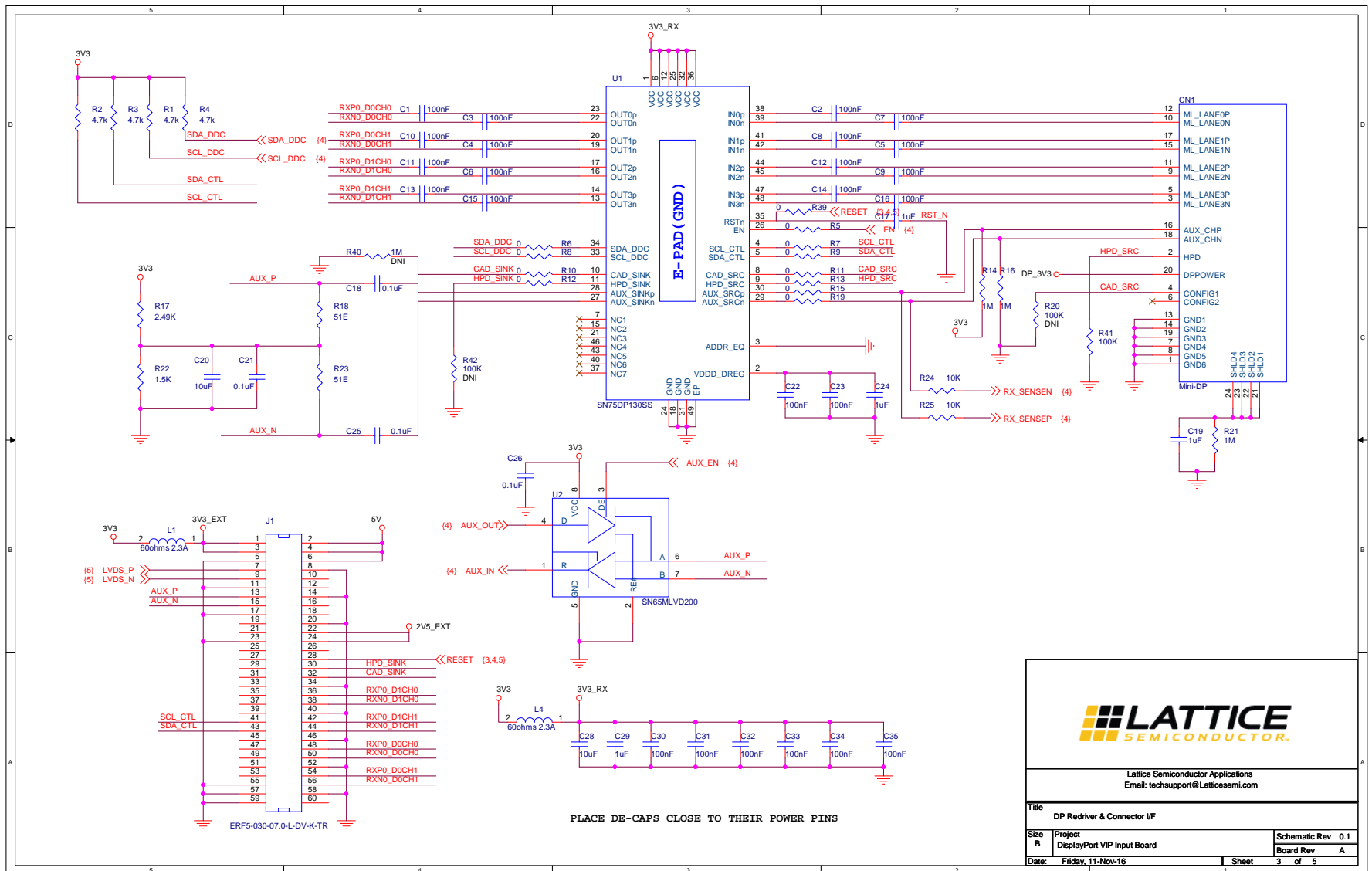


Figure A.2. DP Redriver and Connector I/F

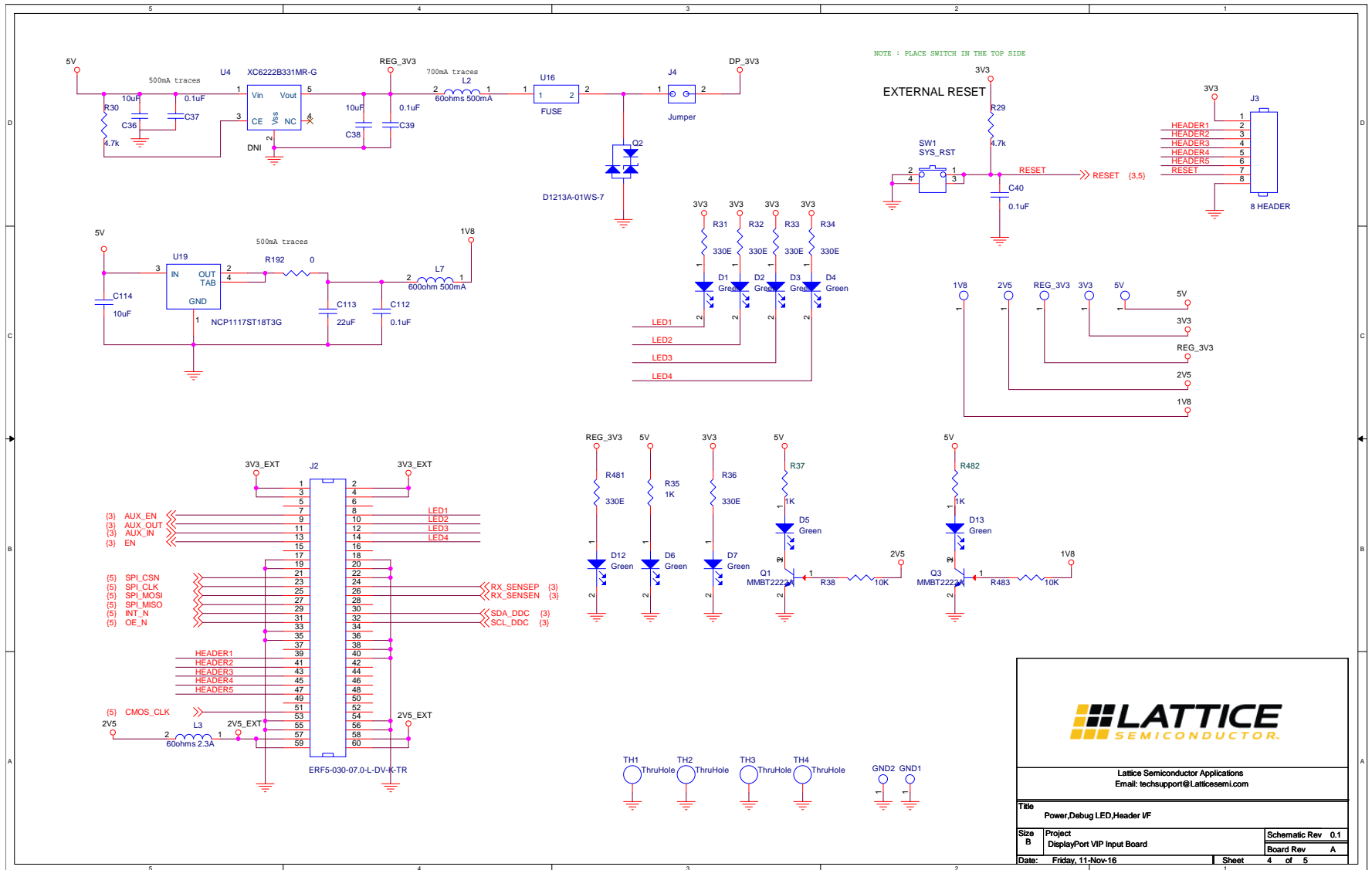


Figure A.3. Power, Debug LED, Header I/F

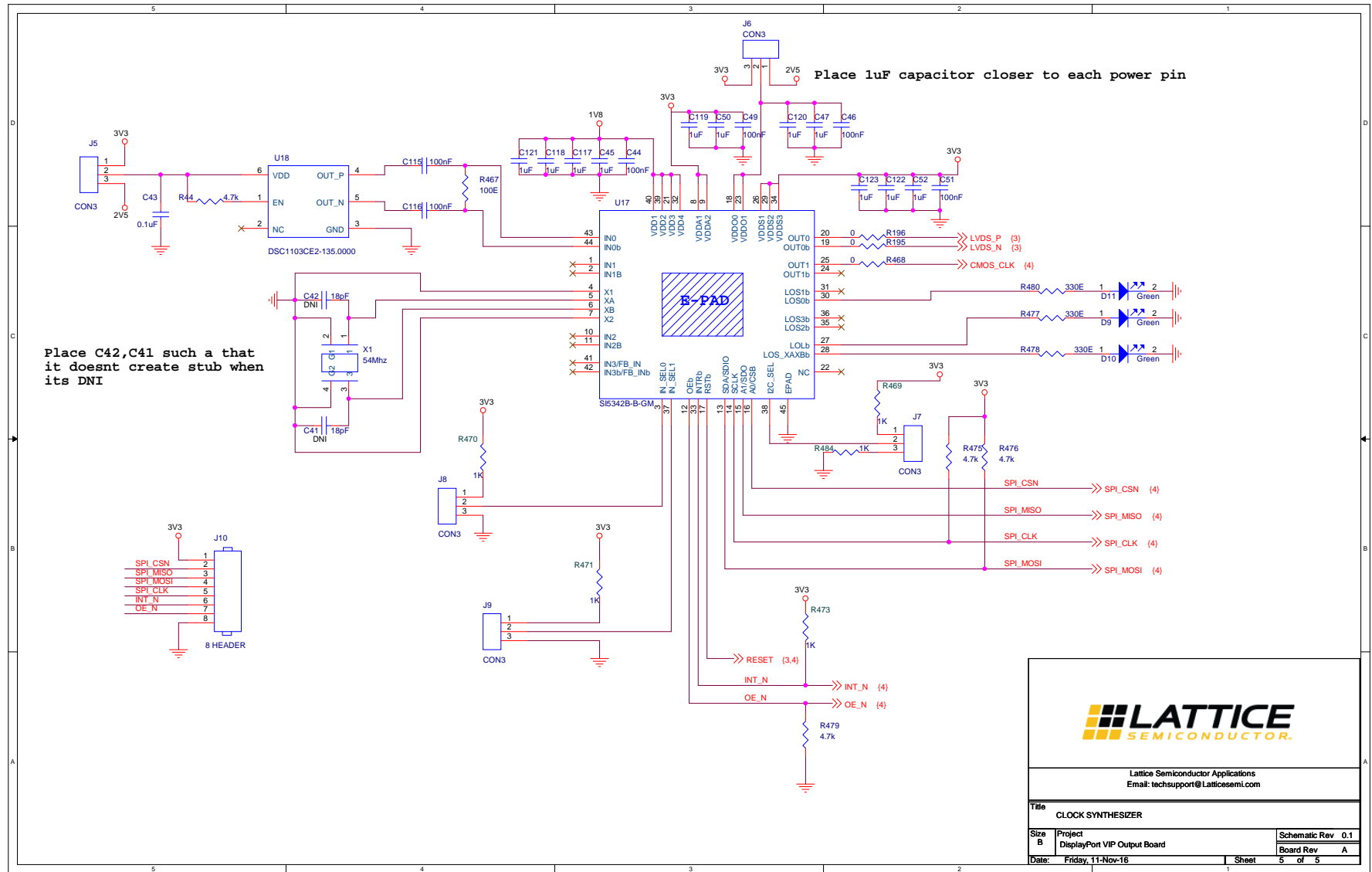


Figure A.4. Clock Synthesizer

Appendix B. DisplayPort VIP Input Board Bill of Materials

Item	Reference	Qty	Value	Comments	Part Number	Manufacturer	Description
1	CN1	1	Mini-DP	—	2129320-3	TE Connectivity	MINI DISPLAYPORT REVERSE OFFSET
2	C1,C2,C3,C4,C5,C6,C7,C8, C9,C10,C11,C12,C13,C14, C15,C16,C115,C116	18	100 nF	—	885012205018	Wurth	CAP CER 0.1UF 10V X7R 0402
3	C17,C19,C24,C29,C45,C47, C50,C52,C117,C118,C119, C120,C121,C122,C123	15	1 uF	—	GRM155R61A105KE15D	Murata	CAP CER 1UF 10V 10% X5R 0402
4	C18,C21,C25,C26,C43	5	0.1 uF	—	GRM155R61A104KA01D	Murata	CAP CER 0.1UF 10V X5R 0402
5	C20,C28	2	10 uF	—	GRM21BR61A106KE19L	Murata	CAP CER 10UF 10V 10% X5R 0805
6	C22,C23,C30,C31,C32,C33, C34,C35,C44,C46,C49,C51	12	100 nF	—	GRM155R61A104KA01D	Murata	CAP CER 0.1UF 10V X5R 0402
7	C36,C38	2	10 uF	—	CL10X106MP8NRNC	Samsung	CAP CER 10UF 10V 20% X6S 0603
8	C37,C39	2	0.1 uF	—	CL05A104MP5NNNC	Samsung	CAP CER 0.1UF 10V X5R 0402
9	C40	1	0.1 uF	—	885012205037	Wurth	CAP CER 0.1UF 16V X7R 0402
10	C41,C42	2	18 pF	DNL	C0402C180K3GACTU	Kemet	CAP CER 18PF 25V C0G 0402
11	C112	1	0.1 uF	—	C0402C104K4RACTU	Kemet	CAP CER 0.1UF 16V X7R 0402
12	C113	1	22 uF	—	LMK212BJ226MG-T	Taiyo Yuden	CAP CER 22UF 10V X5R 0805
13	C114	1	10 uF	—	LMK107BJ106MALTD	Taiyo Yuden	CAP CER 10UF 10V X5R 0603
14	D1,D2,D3,D4,D5,D6,D7,D9, D10,D11,D12,D13	12	Green	—	LTST-C190KGKT	LITE-On Inc	LED GREEN CLEAR 0603 SMD
15	GND1,GND2,5V,1V8,2V5, REG_3V3,3V3	7	TP	DNL	—	—	—
16	J1,J2	2	—	—	ERF5-030-07.0-L-DV-K-TR	Samtec Inc	Conn High Speed Edge Rate Terminal Strip HDR 60 POS 0.5 mm Solder ST SMD T/R -

Item	Reference	Qty	Value	Comments	Part Number	Manufacturer	Description
17	J3,J10	2	8 HEADER	—	—	—	—
18	J4	1	Jumper	—	—	—	—
19	J5,J6,J7,J8,J9	5	CON3	—	—	—	—
20	L1,L3,L4	3	60 Ω 2.3 A	—	MPZ1608Y600B	TDK	FERRITE BEAD 60 OHM 0603 1LN
21	L2	1	60 Ω 500 mA	—	MMZ1608Y600B	TDK	FERRITE BEAD 60 OHM 0603 1LN
22	L7	1	600 Ω 500 mA	—	BLM18AG601SN1D	Murata	FERRITE BEAD 600 OHM 0603 1LN
23	Q1,Q3	2	MMBT2222A	—	MMBT2222A,215	NXP USA Inc.	TRANS NPN 40V 0.6A SOT23
24	Q2	1	D1213A-01WS-7	—	D1213A-01WS-7	Diodes Incorporated	TVS DIODE 3.3VWM 10VC SOD323
25	R1,R2,R3,R4,R29,R30,R44, R475,R476,R479	10	4.7 k	—	CRCW06034K70FKEA	Vishay	RES SMD 4.7K OHM 1% 1/10W 0603
26	R5,R6,R7,R8,R9,R10,R11,R 12,R13,R15,R19,R39,R192, R195,R196,R468	16	0	—	RC0603JR-070RL	Yageo	RES SMD 0.0OHM JUMPER 1/10W 0603
27	R14,R16,R21	3	1 M	—	ERJ-2GEJ105X	Panasonic	RES SMD 1M OHM 5% 1/10W 0402
28	R17	1	2.49 K	—	ERA-2AEB2491X	Panasonic	RES SMD 2.49KOHM 0.1% 1/16W 0402
29	R18,R23	2	51E	—	ERJ-2GEJ510X	Panasonic	RES SMD 51 OHM 5% 1/10W 0402
30	R20,R42	2	100 K	DNL	ERA-2AEB104X	Panasonic	RES SMD 100K OHM 0.1% 1/16W 0402
31	R22	1	1.5 K	—	ERJ-2RKF1501X	Panasonic	RES SMD 1.5K OHM 1% 1/10W 0402
32	R24,R25	2	10 K	—	RMCF0402JT10K0	Stackpole Electronics Inc	RES SMD 10K OHM 5% 1/16W 0402
33	R31,R32,R33,R34,R36,R47 7,R478,R480,R481	9	330E	—	CRCW0402330RFKED	Vishay Dale	RES SMD 330 OHM 1% 1/16W 0402
34	R35	1	1 K	—	RC0603FR-071KL	Yageo	RES SMD 1K OHM 1% 1/10W 0603

Item	Reference	Qty	Value	Comments	Part Number	Manufacturer	Description
35	R37,R469,R470,R471,R473, R482,R484	7	1 K	—	RMCF0402JT1K00	Stackpole Electronics Inc	RES SMD 1K OHM 5% 1/16W 0402
36	R38,R483	2	10 K	—	ERJ-3EKF1002V	Panasonic	RES SMD 10K OHM 1% 1/10W 0603
37	R40	1	1 M	DNL	ERJ-2GEJ105X	Panasonic	RES SMD 1M OHM 5% 1/10W 0402
38	R41	1	100 K	—	ERA-2AEB104X	Panasonic	RES SMD 100K OHM 0.1% 1/16W 0402
39	R467	1	100E	—	TNPW0402100RBEED	Vishay	RES SMD 100 OHM 0.1% 1/16W 0402
40	SW1	1	SYS_RST	—	434153017835	Würth	SWITCH TACTILE SPST-NO 0.05A 12V
41	TH1,TH2,TH3,TH4	4	ThruHole	DNL	—	—	—
42	U1	1	SN75DP130SS	—	SN75DP130SSRGZR	Texas Instruments	IC DISPLYPRT 1:1 REDRIVR 48VQFN
43	U2	1	SN65MLVD200	—	SN65MLVD200AD	Texas Instruments	IC LVDS LINE DVR/RCVR 8-SOIC
44	U4	1	XC6222B331MR-G	DNL	XC6222B331MR-G	Torex Semiconductor Ltd	IC REG LDO 3.3V 0.7A SOT25
45	U16	1	FUSE	—	0154004.DRT	Littelfuse	FUSE BRD MNT 4A 125VAC/VDC 2SMD
46	U17	1	SI5342B-B-GM	DNL	SI5342B-B-GM	Silicon Laboratories	IC CLK BUFFER PLL 44QFN
47	U18	1	DSC1103CE2- 135.0000	DNL	DSC1103CE2-135.0000	Microchip Technology Inc	OSC MEMS 135.000MHZ LVDS SMD
48	U19	1	NCP1117ST18T3G	—	NCP1117ST18T3G	On Semi	IC REG LDO 1.8V 1A SOT223
49	X1	1	54 MHz	—	CX3225SB54000D0WPT C1	AVX Corp/Kyocera Corp	CRYSTAL 54MHZ 8PF SMD
50	DISPLAYPORT-VIP-INPUT BOARD REV1 PCB	1	—	—	305-PD-16-0949	PACTRON	

Revision History

Date	Version	Change Summary
March 2018	1.0	Initial release.



7th Floor, 111 SW 5th Avenue
Portland, OR 97204, USA
T 503.268.8000
www.latticesemi.com